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# Preference for High Salt Concentrations Among Children

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Preference for salt (NaCl) in young children was examined in 2 experiments. In Experiment 1, 2 groups of 14 Black children were given paired-comparison tests with salted soups ranging between 0 and 1.8-M NaCl. Children tended to prefer higher salt concentrations than is typical for adults, but the range of salt concentrations used in testing influenced the distribution of children's preferred salt levels. Experiment 2 directly compared children with their parents, eliminated range effects through a preference-tracking procedure based on the paired-comparison technique, and compared Black and White children's preferences. Children ($n$ = 58) again preferred higher levels of salt than did adults ($n$ = 30). No differences between White and Black children were evident, nor was there an indication that degree of salt exposure determined expressed preferences. It appears that children exhibit maximal preference for more concentrated salty, as well as sweet, liquids than do adults. The basis for this age-related difference is not currently understood.

Nearly all human children and adults consume sodium, mostly as salt (sodium chloride [NaCl]), in excess of known need (Denton, 1982; Fregley & Fregley, 1982). A major reason for this is that people like salty tastes, and consequently, many foods are preferred with added salt. The factors responsible for high salt preferences are not well understood, although it has been suggested that they are the result of conditioning, particularly during childhood (e.g., Dahl, 1972). There is, however, little evidence to support or refute this hypothesis (Beauchamp & Cowart, 1986).

One approach to gaining an understanding of the origins of and factors that shape salt preference is to study its development in infants and young children. In marked contrast to their responses to a sweet liquid, newborn infants do not prefer any concentration of salt relative to water (e.g., Beauchamp & Cowart, 1989; Desor, Maller, & Andrews, 1975; Rosenstein & Oster, 1988), and a few studies have suggested a relative rejection of salt solutions (e.g., Crook, 1977). The ambiguous responses that have been observed in newborns, combined with evidence for postnatal development of salt taste reception and preference in other mammalian species (Ferrel, Mistretta, & Bradley, 1981; Hill & Almli, 1980; Hill, Mistretta, & Bradley, 1982; Midkiff & Bernstein, 1983; Mistretta & Bradley, 1983; Moe, 1986), suggest that humans are relatively insensitive to salt at birth. In fact, to the extent that newborns detect low to moderate concentrations of salt at all, this stimulus may be somewhat negative—although it cannot, of course, be assumed that it elicits a "salty" taste.

For older infants (1–24 months) and young children (2–7 years), taste perception in general and salt taste perception in particular have not received much attention. This is probably due in part to the absence of appropriate, easily administered and easily interpreted methodologies and to rapid changes in physical and mental capabilities, which make it difficult to develop methods that are applicable across this age range. For infants, differential ingestion has been used to assess relative preference in almost all studies. There are, however, certain problems encountered with older infants when using this methodology that do not arise with neonates. For example, they may be less willing to accept unfamiliar bottles or food from an unfamiliar person, and as Filer (1978) has noted, the amount of any particular food eaten in a natural feeding situation may depend as much on the mother's "mechanical skill. . . and determination to feed her infant" (p. 7) as on the infant's preference. Finally, because intake has been the only measure obtained from older infants, there is no cross-validation of the meaningfulness of this measure.

In spite of these difficulties, some data do suggest developmental changes in salt taste during infancy. Intake measures obtained in two studies (see Beauchamp, Cowart, & Moran, 1986) indicate that preferential ingestion of salt water relative to plain water may emerge at approximately 4 months of age. Beauchamp et al. (1986) and Cowart and Beauchamp (1986a) have argued that experience with salty tastes probably does not play a major role in the shift from apparent indifference to salt at birth to acceptance in later infancy; rather, this change in response may reflect postnatal maturation of central or peripheral mechanisms, or both, underlying salt taste perception, allowing for the expression of a largely unlearned preference for saltiness. On the other hand, there is some evidence that, at least by 6 months of age, frequency of dietary exposure to high-so-

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dium foods (although not necessarily total dietary sodium) may affect the degree of preference for salted versus unsalted cereal. In a study of ten 6-month-old infants, Harris and Booth (1987) determined the difference between the amount of salted cereal (100 mg NaCl per 100 g prepared weight) eaten during feedings on 2 days and the amount of unsalted cereal eaten on 2 other days and used that as a measure of salt preference. They found relative preference to be significantly correlated with the number of times the infants were exposed to foods containing at least the amount of sodium in the salted cereal during the week preceding testing; none of the infants actually rejected the salted cereal relative to the unsalted one, however, and all but one exhibited some preference for it by consuming more salted than unsalted cereal.

In sum, studies with infants suggest that there may be an interaction between maturation of salt taste perception and experience with salted foods that serves to establish acceptable levels of salt in food. As a consequence of this interaction, young children might be expected to develop preferences that correspond to the salt levels they typically experience. There are, however, indications that children may prefer higher salt concentrations than are commonly added to foods or preferred by adults, a phenomenon similar to that observed for sweet preferences (e.g., Desor & Beauchamp, 1987). Using a traditional, paired-comparison procedure and a three-stimulus series, we found that Black preschoolers tended to prefer higher levels of salt in soup than is typical of adults (Cowart & Beauchamp, 1986b); in fact, the majority of children tested indicated a preference for the most heavily salted soup included in the stimulus series (0.34-M NaCl). That result left open the question of peak salt preference in this age group. It also raised the issue of whether children would exhibit higher preferences than adults when both groups were tested under the same conditions.

The goals of Experiments 1 and 2 described here were thus fourfold. First, we sought to verify the preliminary observations that children exhibit preferences for higher concentrations of salt in food than do adults. Second, in the course of doing this, we sought to develop an assessment technique that would avoid contextual biases introduced by the traditional paired-comparison method yet would be applicable to individuals 3 years of age and older (see Booth, Thompson, & Shahedian, 1983). Third, we tested whether children from different racial and socioeconomic backgrounds would differ in their salt preferences (see Desor, Greene, & Maller, 1975). Finally, we examined the potential relation between measures of salt exposure and salt preference as a step toward testing the hypothesis that high salt preference among children might be conditioned through dietary exposure.

## Experiment 1A

### Method

In Experiment 1A, a traditional pair-wise comparison method was used in an attempt to determine the range of peak preferences for salt in soup among young children. Salt concentrations were selected to be both above and below the adult ideal as determined in numerous previous studies in our laboratories (e.g., Bertino, Beauchamp, & Engelman, 1982, 1986).

*Subjects.* A total of 14 Black preschool children (8 boys and 6 girls), ranging in age from 37 to 89 months, were recruited from The Well Baby Clinic of Pennsylvania Hospital and met performance criteria. No children were ill at the time of the test. The study was explained to the mother or father, and informed consent was obtained. The age and the race of each child was considered to be that assigned by the mother or father. Generally speaking, children had not eaten immediately before the test.

*Materials.* Beginning as early as 2 years of age, salt preference may be evident only when this taste is presented in an appropriate food context (Cowart & Beauchamp, 1986b). Therefore, soup (Campbell's low-sodium vegetable, with vegetables and most fat removed) served as the base to which salt was added. Soups were served at room temperature, which young children find acceptable (see Cowart & Beauchamp, 1986b). Each sample was approximately 10 ml; the subjects were required to take a sip (2–4 ml) of each and swallow it. Four concentrations of salted soup were prepared: 0.01 (unsalted), 0.18, 0.34, and 0.56-M NaCl (typical published adult preference values center around 0.18 M).

*Procedures.* For each taste test trial, the subject was presented with a pair of soup samples and asked to taste and swallow one and then the other (no rinse between) and then to indicate which one was preferred. Following an intertrial interval of approximately 30 s, during which the subject took a drink of water (5–10 ml), a second trial was initiated. Because pilot work indicated that many children refused to complete more than 12 pairs, this served as the upper limit for both children and adults. Each child was presented with each possible pair of stimuli twice, giving 12 paired comparisons. Testing took place in a private room with a parent present. Stimuli within pairs were presented in both possible orders; the order of the pairs was randomly determined except that all pairs were presented before any was repeated. In earlier tests, it was occasionally observed that a child did not appear to respond in a consistent fashion to saltiness but instead chose, for example, the first stimulus every time. A test was considered valid only when the child chose one concentration as most preferred at least five of the six times it was presented. This was very unlikely to occur if children were consistently responding not to saltiness but to order or some other irrelevant (to us) factor.

### Results and Discussion

Consistent with previous results (Cowart & Beauchamp, 1986b), the majority of the children preferred higher concentrations of salt than are typically observed with adults (Table 1, Series 1). In fact, 7 of the 14 children chose the 0.56-M NaCl soup as most preferred.

## Experiment 1B

The results of Experiment 1A provided no indication that 0.56 M was the maximal level of salt preferred by many of the children. Consequently, a second series that included a still higher salt concentration was evaluated.

### Method

A total of 14 subjects (7 boys and 7 girls; age range = 39–57 months) were selected from the same pool, and the method was identical to that described in Experiment 1A, with the exception that the salt concentrations in the soup were 0.01 (unsalted), 0.18, 0.56, and 1.80-M NaCl.

### Results and Discussion

The highest salt concentration in this series was preferred by a smaller percentage of children than the next lower one, al-

Table 1
*Preferred Level of Salt in Soup Among Black Preschoolers in Experiment 1*

| Children | Level of salt in soup | | | | |
|---|---|---|---|---|---|
| | 0.01 M | 0.18 M | 0.32 M | 0.56 M | 1.80 M |
| Series 1 | | | | | |
| *n* | 2 | 3 | 2 | 7 | n/a |
| % | 14 | 22 | 14 | 50 | n/a |
| Series 2 | | | | | |
| *n* | 6 | 1 | n/a | 5 | 2 |
| % | 43 | 7 | n/a | 36 | 14 |

*Note.* $N = 14$ children in each series.

though one half of the children still chose extraordinarily high concentrations of salt (≥.56 M) as their most preferred (Table 1, Series 2). Surprisingly, however, when presented with this series, almost one half of the children seemed to exhibit an unusually low salt preference, choosing the unsalted soup as their most preferred.

In effect, repeated presentation of a stimulus containing a level of salt well above that preferred by many of the children tested seemed to lead to the rejection of any amount of salt by a substantial number of them. This finding suggests that young children's response choices may be highly susceptible to contextual biases.

As reviewed by Booth et al. (1983), adult responses to sensory stimuli have also been shown to be distorted, although perhaps not as dramatically, by the presentation of stimuli outside of the subject's tolerated range. Booth et al. developed a scaling procedure for assessing preferred levels of a taste that avoids this problem by allowing for the selection of stimulus levels for each subject such that they are centered around the subject's "ideal" level (*tracking*). Consequently, at no time are subjects exposed to levels of the taste far outside their range of acceptability (either much too strong or much too weak).

## Experiment 2

### Method

Booth et al.'s (1983) method cannot easily be used with young children because it entails the use of scales and imposes sophisticated language and memory demands. Instead, we have adapted the idea of tracking to the paired-comparison format. In addition, a pretest was added to ensure that each child understood the task.

*Subjects.* Eighteen Black preschool children (9 boys and 9 girls), ranging in age from 46 to 68 months, and one parent of each (17 mothers, 1 father), ranging in age from 20 to 39 years, were recruited from Pennsylvania Hospital to provide data (2 potential subjects were eliminated because of inconsistent responses). An additional group of 12 older Black children (8 boys and 4 girls; age range = 81–125 months) and 1 parent of each (11 mothers, 1 father; age range = 25–37 years) were tested in an identical manner. Finally, a group of 28 White preschool children (15 boys and 13 girls; age range = 36 to 71 months) was tested because there was a report of a racial difference in salt preferences (Desor, Greene, & Maller, 1975). These children were recruited from local day-care facilities and tended to be from families of higher socioeconomic status than were the Black children. Testing was conducted as described previously, except that parents were not present when the White children were tested.

*Procedure.* A pretest was administered prior to the actual taste test. The children or their parents were asked to name two foods they liked and two foods they did not like. The four possible pairs of preferred and nonpreferred food names were used in a food preference test. Children were asked, "If I have [preferred food] in this cup and [nonpreferred food] in that cup, which one would you like better?" The children qualified for the taste test after correctly identifying the cup containing the hypothetical preferred food in all four of the pairs.

In the new tracking procedure for taste preference testing (a more detailed explanation is found in Cowart & Beauchamp, in press), the following NaCl concentrations were used: 0.01 M, 0.10 M, 0.18 M, 0.32 M, 0.56 M, and 1.00 M; the salt was presented in soup, as described earlier. When it was clear from pretesting that the child understood the task, he or she was presented with a stimulus pair comprising solutions that contained easily discriminable concentrations of NaCl drawn from the middle of the concentration range, 0.18- and 0.56-M NaCl. Each subsequent pair comprised adjacent stimulus concentrations and was determined by the child's preceding preference choice. The procedure continued until the child had consecutively chosen a given concentration of salt when it was paired with both a higher and a lower concentration, or chose either the unsalted or most concentrated salt stimulus twice in a row. This typically required presentation of three to five pairs. The task was then repeated with the members of the stimulus pairs presented in reverse order (i.e., if the stronger stimulus in the first pair was initially presented first, the weaker one would be presented first in the second series). The order in which stronger and weaker stimuli were presented prevented a child from reaching criterion responding if he or she chose on the basis of a first or second position bias. The geometric mean of the salt concentrations chosen in the two trial series provided the estimate of the child's most preferred level of salt. A test was considered invalid if the samples chosen in the two series differed by more than two concentration steps (e.g., 0.01- and 0.18-M choices were considered valid, whereas 0.01 and 0.32 were not). This criterion might exclude not only subjects who did not understand or attend to the task, but also those who were completely indifferent to saltiness. That potential confound in interpretation is not of great concern, however, because no adults and only 2 children failed to meet the criterion.

By tracking preferred tastant concentrations in this way, it was possible to assess preference across a wide range of concentrations, while at the same time limiting both the number of stimulus pairs that it was necessary to present to each child and the extent to which any child was exposed to tastes he or she found aversive. As noted, the procedure also guarded against consistent position biases. Finally, the two trial runs provided information concerning the consistency of the child's response choices.

*Questionnaires.* Each parent tested was asked to complete a questionnaire that included questions concerning frequency of both the child's and the parent's salt usage (e.g., Does the child or parent salt food before it is tasted? Does the parent salt food during cooking?), the family history of hypertension, and the time since the child and parent last ate. A number of other questions that will not be considered here were also asked.

### Results and Discussion

The following questions were examined statistically: Was there a difference between the salt preferences of adults and children? Was there a difference in salt preference related to the race or socioeconomic status of the child? Were a child's preferences correlated with those of his or her parent? Was there

Table 2
*Preferred Level of Salt in Soup: Tracking Data*

| Subjects | ≤.18 M *n* | ≤.18 M % | .24–.42 M *n* | .24–.42 M % | ≥.56 *n* | ≥.56 % | *M* preference |
|---|---|---|---|---|---|---|---|
| Black adults (*n* = 18) | 15 | 83 | 3 | 17 | 0 | 0 | .16 M |
| Black preschoolers (*n* = 18) | 7 | 39 | 8 | 44 | 3 | 17 | .37 M |
| White preschoolers (*n* = 28) | 14 | 50 | 9 | 32 | 5 | 18 | |
| Black adults (*n* = 12) | 9 | 75 | 2 | 17 | 1 | 8 | .20 M |
| Black older children (*n* = 12) | 5 | 42 | 4 | 33 | 3 | 25 | .47 M |

*Note.* Intraclass correlations for Tests 1 and 2 were as follows: Black adults, $r = +0.71$; Black children, $r = +0.72$; and White children, $r = +0.71$; includes subjects dropped from analyses.

any relation between preference levels and responses to questions concerning salt usage or family history of hypertension? Preliminary statistical tests revealed no gender differences, so this variable was not considered further.

Results indicate that preschoolers preferred higher levels of salt than did adults. Moreover, this phenomenon did not appear to be restricted to children from Black, lower socioeconomic populations, who may be exposed to relatively high-sodium diets and on whom our studies have focused in the past. Table 2 (top) depicts the distributions of preferred levels of salt in soup obtained from Black preschoolers drawn from The Well Baby Clinic, Black adults who were their parents, and White preschoolers drawn from middle- to upper-middle-class families. Of the 18 child–parent pairs, the child preferred a higher salt concentration than did the parent in 14 cases ($p = .015$; binomial test). For the purpose of chi-square analyses, preferred concentrations of salt were characterized as being typical of those previously reported for adults (≤0.18-M NaCl; see, e.g., Bertino et al., 1982) or above typical adult preferences (≥0.24 M). The distributions of preferred concentrations for the two groups of preschoolers do not differ, $\chi^2(N = 46) = 0.19, p > .25$. The distribution of the children's salt preferences (combining the two groups) does differ from that of the adults, $\chi^2(N = 46) = 6.01, p < .02$. That is, the children were more likely than were the parents to prefer highly salted soups.

The results obtained from the older children and their parents were similar (Table 2, bottom): Of the 12 child–parent pairs, the child exhibited the higher salt preference in eight instances, and in two cases the preferences were equivalent ($p = .055$; binomial test). Comparisons of older and younger Black children revealed no difference, $\chi^2(N = 30) = 0.05, p > .25$, in preference. Finally, intraclass correlations between Test 1 and Test 2 for the Black adults, Black children, and White children were between +.71 and +.72 (Table 2).

Because there were no age-related differences among Black children, correlations and chi-square analyses were conducted comparing questionnaire data (frequency of salt usage, family history of hypertension) and preferred levels of salt obtained from the 30 Black children, 30 Black parents, and 28 White children.

The results with children were uniformly uninformative. The parent was asked three questions that probed the child's exposure to salt: (a) Do you use salt in cooking? (b) Do you salt your child's food at the table? and (c) Does your child salt his or her own food at the table? Answers could be *never* (1), *occasionally* (2), *often* (3), or *always* (4). A combined score was calculated as the sum of the scores for each question and could thus range from 3 to 12. For the entire sample of children ($N = 58$), the mean score was 4.97 (±1.24 *SD*). For statistical analyses, 2 × 2 contingency tables were constructed by placing children into one of the four categories on the basis of salt preferences (≤.18 M vs. ≥.24 M) and salt exposure score (less than or greater than the mean). For neither group of children was there any evidence that exposure scores were related to salt taste preference (Table 3). The mean exposure score for Blacks (5.30, ±1.32 *SD*) was slightly greater than for Whites (4.68, ±1.44 *SD*), $t(56) = 1.72$, $56, p < .10$.

In contrast to the data for children, adult responses to similar questions—(a) Do you salt food before tasting it? and (b) Do you use salt in cooking?—were related to the salt taste preference results (Table 3), with those adults with higher preferences being more likely to use salt in cooking, to salt their food before tasting it, or both. Similar results with adults have been reported previously (e.g., Beauchamp, Bertino, & Engelman, 1985; Maller, Cardello, Sweeney, & Shapiro, 1982).

Questions concerning family history of hypertension, heart attacks, or stroke were not related to either children's or adults' salt preference or to salt exposure scores. The correlation between child and parent salt preferences was low ($r = +.01$, $p > .25$).

## General Discussion

These studies document a preference for higher levels of salt in soup among young children compared with that preferred by their parents. This result is consistent with previous work

Table 3
*Number of Subjects Scoring Above and Below the Mean Combined Score for Salt Exposure as Determined by Questionnaires*

| Subjects/questionnaire | Preferred level of salt ≤.18 M | Preferred level of salt ≥.24 M | $\chi^2$ |
|---|---|---|---|
| Black children | | | |
| Above children's mean | 9 | 11 | 0.16 |
| Below children's mean | 3 | 7 | |
| White children | | | |
| Above children's mean | 6 | 7 | 0.00 |
| Below children's mean | 8 | 7 | |
| Black parents | | | |
| Above adults' mean | 7 | 5 | 3.84* |
| Below adults' mean | 17 | 1 | |

* $p = .05$ (Fisher's exact test: $p = .03$).

with both children (Cowart & Beauchamp, 1986b) and adolescents (Desor, Greene, & Maller, 1975). What factors could be responsible for these high preferences? Several hypotheses can be suggested, although none are clearly supported by existing data.

First, we previously reported (Beauchamp et al., 1986) that increased acceptability of moderate concentrations of aqueous NaCl is first evident at about 4 months of age. This change in response is thought to represent, in part, postnatal maturation of central or peripheral mechanisms underlying salt taste perception, a proposal consistent with neurophysiological data from rats and sheep indicating postnatal maturation of NaCl responses (Hill et al., 1982; Mistretta & Bradley, 1983). Perhaps a relative insensitivity to salt continues through childhood, and as a consequence, higher concentrations are required to obtain a preferred level of saltiness. There is, however, no direct evidence that young children are less sensitive (have higher thresholds or flatter intensity functions) than adults (Cowart, 1981). If both older infants and young children were relatively insensitive to the taste of salt, it could be predicted that preferences for high salt concentrations (e.g., 0.40 M or greater) would also be evident in infancy. A recent study (Marsh, Beauchamp, & Cowart, 1988) does not provide support for this prediction.

The high preferences observed in childhood could be conditioned by environmental exposure. Perhaps in the populations studied, infants and children are exposed to particularly high levels of salt. Exposure has been shown to influence level of salt preference in experimental studies with adults (Beauchamp, 1987; Bertino et al., 1982, 1986; Blais et al., 1986; Teow, DiNicolantonio, & Morgan, 1984). Generally speaking, decreases in salt consumption are followed by decreases in the most preferred level of salt in food; the reverse is also the case. Among infants, Harris and Booth (1987) have presented evidence of a correlation between consumption of salted versus unsalted cereal and prior exposure to high-sodium foods. However, in the absence of evidence that young children consume relatively more salt or more high-sodium foods than do adults, this explanation for children's high salt preference remains speculative.

Third, the age difference may not be specific to salt. It is striking that a similar age difference in taste preference exists for sweets: Children prefer sweeter-tasting beverages than do adults (e.g., Desor & Beauchamp, 1987; Desor, Greene, & Maller, 1975; Grinker, Price, & Greenwood, 1976). It has been suggested that this developmental change reflects an underlying shift in caloric needs manifested as a high-sweet preference due to the association between sweet taste and calorie sources (Beauchamp & Cowart, 1987). This explanation has been questioned on both empirical and logical grounds, however (Desor & Beauchamp, 1987). Perhaps a more generalized shift occurs between childhood and adulthood so that strong, hedonically positive sensory stimuli are more attractive to younger individuals and negative stimuli are more offensive (but see Engen, 1974, for contradictory data on developmental changes in olfaction).

Fourth, it is possible that adults' expressed preferences are, to a greater degree than children's, altered by cognitive factors. For example, in responding to the preference question, adults may attempt to make a judgment about which stimulus they would be most likely to consume in quantity, whereas children may base their judgments more directly on the immediate sensory pleasure elicited by each stimulus. Also, adults may be more swayed than are children by feelings and beliefs as to what level of salt one *ought* to prefer.

Finally, it is conceivable that the children have more difficulty than do adults separating perceived intensity from pleasantness. Contrary to this explanation, however, paired-comparison data have shown that when salt is placed in water rather than in soup, preschool children reject the salty water relative to plain water at concentrations as low as 0.18-M NaCl (Cowart & Beauchamp, 1986b). Thus, children are perfectly capable of exhibiting rejection of salt, even at a relatively low concentration, when it appears in an inappropriate medium.

It is impossible to definitively choose one of these explanations (or to reject all of them) given the present state of knowledge of the development of taste perception and preference. The absence in this study of a correlation between preference level and exposure as determined by questionnaires could be due to inadequacies of the questionnaire, the measure of preference obtained, or both. Studies in infants and children have demonstrated that early exposure to sucrose in water influences the extent to which sucrose solution will be preferentially consumed at 6 months and at 2 years but that this exposure effect is specific to sucrose solutions—it does not extend to sucrose in a fruit-flavored base (Beauchamp & Moran, 1982, 1985). In the present context, it may be that tests of salt preference in soup reflect only exposure to saltiness in soup, although it is very difficult to understand preference for salt levels far in excess of those commercially available (e.g., 0.32 M and greater).

The specific salt exposure questions used were chosen because they have, in previous studies, correlated with adult preferences (e.g., Beauchamp et al., 1985; Maller et al., 1982). Consistent with those results, salt exposure scores were related to adult salt preference. The absence of a parallel relation among the children remains problematic. In future work, a more accurate estimation of salt exposure will be necessary to further evaluate the relation, if any, between preference and exposure in young children. This is particularly important because it is now evident that 90% or more of the sodium consumed by adults comes from sources other than that added by the individual in food preparation or at the table (reviewed in Beauchamp, Bertino, & Engelman, 1987).

Finally, the validity of the preference tests used needs further evaluation. Results of Experiment 1 indicate that one half of the children exhibited a preference for excessively high ($\geq$0.56 M) levels of salt in soup but that for some children, preference seemed to be strongly influenced by the range of test concentrations (contrast Experiments 1A and 1B). To reduce or eliminate this range effect, the tracking method described in Experiment 2 was designed. Generally, this method seemed to eliminate obvious range effects and to still demonstrate a higher salt preference in children relative to adults. However, results from the tracking procedure also indicated that children's preferences were somewhat lower than those found when the traditional paired-comparison procedure was used. Whereas 14 of 28 subjects in Experiment 1 most frequently preferred 0.56 M or greater, this was true in only 6 of 30 Black children in Experiment 2, $\chi^2(N = 58) = 4.52, p < .05$. Although we cannot explain this difference, range effects could also be involved here. In Experiment 2, the intraclass correlations for preferences obtained in the two runs for each individual tested were moderately high (Table 2). Preliminary data indicate that reliability of this type of test is also reasonably high (e.g., for the paired-comparison tasks, $r = +.62$, $n = 9$ children; unpublished data from tests administered about 1 week apart), but its ability to predict food choice and salt consumption remains to be elucidated. An underlying assumption of such preference tests is that they are predictive of food or nutrient consumption, but this has rarely been evaluated (see Mattes, 1985). Research with adults demonstrating changes in expressed preference as a function of changes in salt intake supports this interpretation; however, the lack of a relation in this study between measures of exposure and preference in the children leaves open the question of validity (cf. Birch, 1979a, 1979b; Birch & Marlin, 1982).

In summary, the understanding of human salt taste preferences during late infancy and early childhood is still quite limited. There are several lines of evidence indicating that familiarity, dietary experience, or both begin to influence taste and food preferences early in life. At the same time, however, young children often prefer more concentrated salty tastes than they are likely to encounter in their normal diet. Further exploration of relations between dietary history and taste preferences in early childhood is required. Studies of possible parallels between age-related changes in preferences for sweet and salty tastes might also provide insight into the bases for the extreme preferences observed in some young children.

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